INCH-POUND

C-F-206G
June 27, 1989
SUPERSEDING
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September 29, 1983

FEDERAL SPECIFICATION

FELT SHEET: CLOTH, FELT, WOOL, PRESSED

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers mechanical-roll felt, sheet felt, and apparel and decorative-roll felt (see 6.5).

1.2 Classification.

1.2.1 Types and classes. The classification number, thickness, and weight shall be as specified in tables I, II, III, and IV (see 6.2). The felt shall be of the following types and classes as specified:

Type I - Mechanical-roll felt
Type II - Sheet felt
  Class 1 - Fine Spanish
  Class 2 - Spanish
  Class 3 - Mexican
  Class 4 - Coarse Mexican
Type III - Roll-felt (apparel and decorative)
Type IV - Needle punched-roll felt

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 8305

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2. APPLICABLE DOCUMENTS

2.1 Government documents. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

Federal Specifications:

A-A-203	- Paper, Kraft, Untreated
T-T-871	- Twine, Cotton, Wrapping
T-T-911	- Twine, Fibrous, Jute
CCC-C-429	- Cloth, Osnaburg, Cotton
CCC-C-467	- Cloth, Burlap, Jute (or Kenaf)
PPP-B-601	- Boxes, Wood, Cleated-Plywood
PPP-B-621	- Boxes, Wood, Nailed and Lock-Corner
PPP-T-45	- Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing

Federal Standards:

FED-STD-123	- Marking for Shipment (Civil Agencies)
FED-STD-191	- Textile Test Methods

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-0001.)

(Single copies of this specification, and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes, are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-F-2312	- Felt, Hair or Wool: Mildew Resistant and Moisture Resistant Treatment For
MIL-L-10547	- Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible
MIL-T-40625	- Tubing, Bias Sewn (Burlap or Osnaburg), Cloth

Military Standards:

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	- Marking for Shipment and Storage
MIL-STD-147	- Palletized Unit Loads
MIL-STD-731	- Quality of Wood Members for Containers and Pallets

(Copies of military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Federal Regulations:

Methods of Test for Grade of Wool Top

(Application for copies should be addressed to the U.S. Department of Agriculture, Standardization and Review Branch, Livestock and Seed Division, Agricultural Marketing Service, P.O. Box 96456, Room 2649-S, Washington, DC 20090-6456.)

Rules and Regulations Under the Wool Products Labeling Act (16 CFR Part 300)

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-0001. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

American Society for Testing and Materials (ASTM)

D 3951 - Standard Practice for Commercial Packaging

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Standard sample. The finished felt shall match the standard sample for shade and appearance and shall be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

3.3 Material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.3.1 Wool. The wool fibers shall be fleece, pulled wool, wool noil, reprocessed wool, reused wool, or a combination thereof. The grade of wool shall conform to or be finer than the U.S. Standards specified in 3.3.1.1 for type II and in table III for type III. Any grade of wool is acceptable for type I and type IV felts.

3.3.1.1 Type II felts. The grades of wool for type II felts shall be as follows:

Class 1. Fine Spanish, or its equivalent, composed of white wools, U.S. Standard 62's or finer, scoured, carbonized, dusted, neutralized, depitched, and depainted.

Class 2. Spanish, or its equivalent, composed of white wools, U.S. Standard 58's or finer, scoured, carbonized, dusted, and neutralized.

Class 3. Mexican, or its equivalent, composed of wool, 75 percent U.S. Standard 56's or finer and 25 percent U.S. Standard 48's or finer, scoured, and dusted.

Class 4. Coarse Mexican, or its equivalent, composed of wool, 60 percent U.S. Standard 50's or finer and 40 percent U.S. Standard 44's or finer.

3.4 Physical and chemical requirements. Each felt within a group of classification numbers is available in each of the thicknesses and weights listed for the group (see 6.2). The felt shall conform to the physical and chemical requirements as follows:

Type I - Table I
Type II - Table II
Type III - Table III
Type IV - Table IV

TABLE I. Chemical and physical requirements for type I felts

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent: 1,1,1-trichloroethane (max)	Soluble matter percent: Water (max)	Soluble matter percent: Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches: Nominal	Thickness, inches: Min	Thickness, inches: Max	Weight, lb per sq yd: Min	Weight, lb per sq yd: Max
18R1	Laundry	95	2.5	2.5	3.0	1.5	600	35	60 or 72	White	1/8	0.113	0.137	2.15	2.35
											3/16	0.175	0.201	3.23	3.53
											1/4	0.236	0.264	4.30	4.70
											5/16	0.298	0.328	5.38	5.88
											3/8	0.359	0.391	6.45	7.05
											1/2	0.481	0.519	8.60	9.40
16R1X	F-50	95	2.5	2.5	3.0	1.5	500	-	60 or 72	White	3/64	0.040	0.054	0.71	0.79
											1/16	0.056	0.070	0.94	1.01
											5/64	0.071	0.085	1.16	1.24
16R3X	F-51 Ball bearing	92	2.5	2.5	4.5	2.5	300	-	60 or 72	Gray	3/32	0.087	0.101	1.39	1.46

TABLE I. Chemical and physical requirements for type I felts (cont'd)

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches Nominal	Thickness, inches Min	Thickness, inches Max	Weight, lb per sq yd Min	Weight, lb per sq yd Max
											1/16	0.050	0.075	0.95	1.05
											1/8	0.113	0.137	1.90	2.10
											3/16	0.175	0.201	2.85	3.15
											1/4	0.236	0.264	3.80	4.20
											5/16	0.298	0.328	4.75	5.25
16R1	F-1	95	2.5	2.5	3.0	1.5	500	33	60 or 72	White	3/8	0.359	0.391	5.70	6.30
											1/2	0.481	0.519	7.60	8.40
16R2	F-2 Backcheck	90	2.5	2.5	4.0	2.0	500	28	60 or 72	Any, except gray or black	5/8	0.603	0.647	9.50	10.50
											3/4	0.725	0.775	11.40	12.60
											7/8	0.847	0.903	13.30	14.70
											1	0.969	1.031	15.20	16.80

TABLE I. Chemical and physical requirements for type I felts (cont'd)

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Water (max)	Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches Nominal	Min	Max	Weight, lb per sq yd Min	Max
16R3	F-3 Backcheck	85	2.5	3.0	4.5	2.5	400	22	60 or 72	Gray	1/8	0.113	0.137	1.90	2.10
											3/16	0.175	0.201	2.85	3.15
											1/4	0.236	0.264	3.80	4.19
											5/16	0.298	0.328	4.75	5.24
											3/8	0.359	0.391	5.70	6.29
											1/2	0.481	0.519	7.60	8.39
											5/8	0.603	0.647	9.50	10.49
											3/4	0.725	0.775	11.40	12.59
											7/8	0.847	0.903	13.30	14.69
											1	0.969	1.031	15.20	16.79
12R3X	F-55 Lining	75	4.0	4.0	8.0	3.0	200	-	60 or 72	Gray or black	1/16	0.056	0.070	0.71	0.79
											3/32	0.087	0.101	1.09	1.16

TABLE I. Chemical and physical requirements for type I felts (cont'd)

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches Nominal	Thickness, inches Min	Thickness, inches Max	Weight, lb per sq yd Min	Weight, lb per sq yd Max
											1/8	0.111	0.139	1.45	1.61
											3/16	0.172	0.204	2.17	2.41
											1/4	0.232	0.268	2.90	3.22
											5/16	0.293	0.333	3.62	4.02
											3/8	0.353	0.397	4.35	4.83
12R1	F-5	95	2.5	2.5	3.0	2.0	400	18	60 or 72	White	1/2	0.474	0.526	5.80	6.80
											5/8	0.595	0.655	7.25	8.05
12R2	F-6	87	2.5	2.5	4.5	2.5	275	16	60 or 72	Gray	3/4	0.716	0.784	8.70	9.66
											7/8	0.837	0.913	10.15	11.27
12R3	F-7 Extra firm pad	80	4.0	4.0	7.0	3.0	250	12	72	Gray	1	0.958	1.042	11.60	12.88

TABLE I. Chemical and physical requirements for type I felts (cont'd)

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches Nominal	Thickness, inches Min	Thickness, inches Max	Weight, lb per sq yd Min	Weight, lb per sq yd Max
											1/16	0.050	0.075	0.60	0.70
											1/8	0.105	0.145	0.98	1.14
											3/16	0.165	0.211	1.47	1.71
9R1	F-10	95	2.5	2.5	3.0	2.5	225	8	72	White	1/4	0.224	0.276	1.96	2.28
9R2	F-11	87	3.0	2.5	4.5	3.0	200	6	72	Gray	5/16	0.284	0.342	2.45	2.85
9R3	F-12	85	4.0	2.5	6.5	3.5	100	3	72	Gray	3/8	0.343	0.407	2.94	3.42
9R4 4/	F-13	75	4.0	4.0	8.0	3.5	75	2	72	Gray	1/2	0.462	0.538	3.92	4.56
9R5	F-15	55	4.0	5.0	9.0	4.0	75	2	72	Gray	5/8	0.581	0.669	4.90	5.70
											3/4	0.700	0.800	5.88	6.84
											7/8	0.819	0.931	6.86	7.98
	Firm pad								5/		1	0.938	1.062	7.84	9.12
											2	1.875	2.125	15.68	18.24

TABLE I. Chemical and physical requirements for type I felts (cont'd)

Classification number	Corresponding S.A.E. felt number 1/ and trade designation	Wool fiber content 2/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 3/	Splitting resistance (min) lb per 2 inches of width 3/	Width (min) inches	Color	Thickness, inches Nominal	Thickness, inches Min	Thickness, inches Max	Weight, lb per sq yd Min	Weight, lb per sq yd Max
8R5	F-26 Soft pad	45	8.0	6.0	14.0	5.0	-	-	72 or 36	Gray	1/8	0.085	0.165	0.81	0.99
											1/4	0.194	0.306	1.62	1.98
											3/8	0.303	0.447	2.43	2.97
											1/2	0.412	0.588	3.24	3.96
											3/4	0.630	0.870	4.86	5.94
											1	0.848	1.152	6.48	7.92

1/ These numbers are given for information purposes only and are not to be considered as specification requirements.

2/ The wool fiber content shall be based on the original dry weight of the specimen when tested as specified in 4.4.3.

3/ The requirement is applicable to both lengthwise and crosswise directions separately.

4/ To achieve a desired 2-inch thickness, it is acceptable to bond two 1-inch thick layers of felt together positioning a doublefaced film between the two layers of felt and applying pressure without heating the materials. The adhesive used shall be neoprene or acrylic.

5/ Sheet size shall be specified minimum.

TABLE II. Chemical and physical requirements for type II felts

Classification number	Wool fiber content 1/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Water thickness swell (max) percent	Color 3/	Thickness 4/, inches Nominal	Thickness 4/, inches Min	Thickness 4/, inches Max	Weight, lb per sq yd Nominal	Weight, lb per sq yd Min	Weight, lb per sq yd Max
12-S:										1/4	0.230	0.270	3.00	2.80	3.20
										3/8	0.351	0.399	4.50	4.20	4.80
										1/2	0.470	0.530	6.00	5.60	6.40
1	95	2.0	2.0	3.0	1.5	400	18	20	White	5/8	0.590	0.660	7.50	7.05	7.95
										3/4	0.710	0.790	9.00	8.50	9.50
2	95	2.5	2.5	3.5	1.5	300	16	25	White	7/8	0.829	0.921	10.50	9.95	11.05
										1	0.949	1.051	12.00	11.40	12.60
3	95	2.5	2.5	3.5	2.0	300	12	30	White	1-1/4	1.188	1.312	15.00	14.30	15.70
										1-1/2	1.428	1.572	18.00	17.20	18.80
4	95	2.5	2.5	4.0	2.5	300	10	30	White	1-3/4	1.667	1.833	21.00	20.10	21.90
										2	1.906	2.094	24.00	23.00	25.00
										2-1/2	2.385	2.615	30.00	28.95	31.05
										3	2.864	3.136	36.00	34.90	37.10

TABLE II. Chemical and physical requirements for type II felts (cont'd)

Classification number	Wool fiber content 1/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Water thickness swell (max) percent	Color 3/	Thickness 4/, inches Nominal	Thickness 4/, inches Min	Thickness 4/, inches Max	Weight, lb per sq yd Nominal	Weight, lb per sq yd Min	Weight, lb per sq yd Max
16-S:										1/8	0.113	0.137	2.00	1.90	2.10
										3/16	0.176	0.200	3.00	2.85	3.15
										1/4	0.234	0.266	4.00	3.70	4.30
1	95	2.0	2.0	3.0	1.5	500	32	25	White	3/8	0.356	0.394	6.00	5.60	6.40
										1/2	0.478	0.522	8.00	7.50	8.50
2	95	2.5	2.5	3.5	1.5	400	28	30	White	5/8	0.599	0.651	10.00	9.40	10.60
										3/4	0.721	0.779	12.00	11.30	12.70
3	95	2.5	2.5	3.5	2.0	400	22	35	White	7/8	0.843	0.907	14.00	13.25	14.75
										1	0.964	1.036	16.00	15.20	16.80
4	95	2.5	2.5	4.0	2.5	300	20	35	White	1-1/4	1.208	1.292	20.00	19.10	20.90
										1-1/2	1.451	1.549	24.00	23.00	25.00
										1-3/4	1.694	1.806	28.00	26.90	29.10
										2	1.937	2.063	32.00	30.80	33.20
										2-1/2	2.424	2.576	40.00	38.75	41.25
										3	2.910	3.090	48.00	46.70	49.30

TABLE II. Chemical and physical requirements for type II felts (cont'd)

Classification number	Wool fiber content 1/ (min) percent	Soluble matter percent: 1,1,1-trichloroethane (max)	Soluble matter percent: Water (max)	Soluble matter percent: Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Water thickness swell (max) percent	Color 3/	Thickness 4/, inches: Nominal	Thickness 4/, inches: Min	Thickness 4/, inches: Max	Weight, lb per sq yd: Nominal	Weight, lb per sq yd: Min	Weight, lb per sq yd: Max
20-S:										1/8	0.113	0.137	2.50	2.20	2.80
										3/16	0.176	0.200	3.75	3.40	4.10
										1/4	0.236	0.264	5.00	4.60	5.40
1	95	2.0	2.0	3.0	1.5	600	44	30	White	3/8	0.359	0.391	7.50	7.00	8.00
										1/2	0.481	0.519	10.00	9.40	10.60
2	95	2.5	2.5	3.5	1.5	500	40	40	White	5/8	0.603	0.647	12.50	11.80	13.20
										3/4	0.725	0.775	15.00	14.20	15.80
3	95	2.5	2.5	3.5	2.0	400	36	50	White	7/8	0.848	0.902	17.50	16.60	18.40
										1	0.970	1.030	20.00	19.00	21.00
4	95	2.5	2.5	4.0	2.5	300	32	50	White	1-1/4	1.214	1.286	25.00	23.90	26.10
										1-1/2	1.459	1.541	30.00	28.80	31.20
										1-3/4	1.703	1.797	35.00	33.70	36.30
										2	1.947	2.053	40.00	38.60	41.40
										2-1/2	2.436	2.564	50.00	48.55	51.45
										3	2.925	3.075	60.00	58.50	61.50

TABLE II. Chemical and physical requirements for type II felts (cont'd)

Classification number	Wool fiber content 1/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Water thickness swell (max) percent	Color 3/	Thickness 4/, inches Nominal	Thickness 4/, inches Min	Thickness 4/, inches Max	Weight, lb per sq yd Nominal	Weight, lb per sq yd Min	Weight, lb per sq yd Max
26-S:										1/8	0.115	0.135	3.25	2.85	3.65
										3/16	0.178	0.198	4.90	4.40	5.40
										1/4	0.239	0.261	6.50	5.90	7.10
1	95	2.0	2.0	3.0	1.5	600	48	40	White	3/8	0.362	0.388	9.75	8.95	10.55
										1/2	0.484	0.516	13.00	12.00	14.00
2	95	2.5	2.5	3.5	1.5	500	46	50	White	5/8	0.607	0.643	16.25	15.15	17.35
										3/4	0.730	0.770	19.50	18.30	20.70
										7/8	0.853	0.897	22.75	21.45	24.05
3	95	2.5	2.5	3.5	2.0	400	40	60	White	1	0.975	1.025	26.00	24.60	27.40
										1-1/4	1.221	1.270	32.50	31.00	34.00
4	95	2.5	2.5	4.0	2.5	400	30	60	White	1-1/2	1.467	1.533	39.00	37.40	40.60
										1-3/4	1.712	1.788	45.50	43.80	47.20
										2	1.958	2.042	52.00	50.20	53.80

TABLE II. Chemical and physical requirements for type II felts (cont'd)

Classification number	Wool fiber content 1/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Water thickness swell (max) percent	Color 3/	Thickness 4/, inches Nominal	Thickness 4/, inches Min	Thickness 4/, inches Max	Weight, lb per sq yd Nominal	Weight, lb per sq yd Min	Weight, lb per sq yd Max
32-S:															
										1/8	0.118	0.132	4.00	3.50	4.50
										3/16	0.181	0.195	6.00	5.25	6.75
										1/4	0.243	0.257	8.00	7.00	9.00
1	95	2.0	2.0	3.0	1.5	600	50	50	White	3/8	0.366	0.384	12.00	10.90	13.10
										1/2	0.489	0.511	16.00	14.80	17.20
2	95	2.5	2.5	3.5	1.5	500	48	60	White	5/8	0.612	0.638	20.00	18.70	21.30
										3/4	0.735	0.765	24.00	22.60	25.40
3	95	2.5	2.5	3.5	2.0	400	46	70	White	7/8	0.858	0.892	28.00	26.50	29.50
										1	0.981	1.019	32.00	30.40	33.60
4	95	2.5	2.5	4.0	2.5	400	40	70	White	1-1/4	1.228	1.272	40.00	38.30	41.70
										1-1/2	1.474	1.526	48.00	46.20	49.80
										1-3/4	1.712	1.779	56.00	54.10	57.90
										2	1.968	2.032	64.00	62.00	66.00

1/ The wool fiber content shall be based on the original dry weight of the specimen when tested as specified in 4.4.3.

2/ The requirement is applicable to both lengthwise and crosswise directions separately.

3/ Other colors are manufactured on order.

4/ Sheets of 1/16-inch thickness are manufactured on order in type Nos. 26-S and 32-S.

TABLE III. Chemical and physical requirements for type III felts

Classification number	Trade designation	Grade of wool (min)	Width (min) inches	Thickness, inches			Weight per square yard			Wool content 1/ (min) percent	Color	Soluble matter, 1,1,1-trichloroethane (max) percent	Breaking strength (min) pounds 2/
				Nominal	Min	Max	Nominal	Min	Max				
							oz	oz	oz				
11A2	Coat front	48's	80	0.030	0.025	0.035	3.04	2.92	3.15	20	Gray	5.0	-
11A1	Coat front	48's	80	0.030	0.025	0.035	3.04	2.92	3.15	20	White	5.0	-
10A2	Lining	48's	72	0.065	0.055	0.075	6.0	5.75	6.25	45	Gray	5.0	8
10A1	Lining, shoe tongue	48's	72	0.065	0.055	0.075	6.0	5.75	6.25	35	White	5.0	10
9A2	Lining	48's	72	0.075	0.060	0.090	7.0	6.75	7.25	45	Gray	5.0	10
8A1	Undercollar, face mask	58's	72	0.040	0.030	0.050	8.0	7.50	8.50	95	White & all colors	5.0	30
7A1	Chevron facing, cap	62's	60	0.040	0.030	0.050	10.0	9.25	10.75	95	White & all colors	5.0	45
6A1	Chevron backing, auto flags & face mask	62's	72	0.063	0.053	0.073	12.0	11.0	13.0	95	White & all colors	5.0	30

TABLE III. Chemical and physical requirements for type III felts (cont'd)

Classification number	Trade designation	Grade of wool (min)	Width (min) inches	Thickness, inches			Weight per square yard			Wool content 1/ (min) percent	Color	Soluble matter, 1,1,1-trichloroethane (max) percent	Breaking strength (min) pounds 2/
				Nominal	Min	Max	Nominal	Min	Max				
							lb	lb	lb				
5A1	Orthopedic	56's	72	0.125	0.085	0.165	1.00	0.94	1.06	35	White	-	-
	truss &	56's	72	0.250	0.198	0.302	2.00	1.88	2.13	35	White	-	-
	athletic	56's	72	0.375	0.311	0.438	3.00	2.75	3.25	35	White	-	-
	pad	56's	72	0.500	0.425	0.575	4.00	3.75	4.25	35	White	-	-
4A1	Surgical	56's	36	0.063	0.048	0.079	0.53	0.50	0.56	50	White	-	20
		56's	72	0.125	0.085	0.165	1.06	1.00	1.12	50	White	-	45
		56's	72	0.375	0.335	0.415	3.00	2.875	3.125	50	White	-	175
3A1	Midsole	-	60 by 40 sheets	0.250	0.250	0.265	7.15	6.50	7.80	95	Gray	-	-

1/ The wool fiber content shall be based on the original dry weight of the specimen when tested as specified in 4.4.3.

2/ The requirement is applicable to both lengthwise and crosswise directions separately.

TABLE IV. Chemical and physical requirements for type IV felts

Classification number	Trade designation	Wool fiber content 1/ (min) percent	Soluble matter percent 1,1,1-trichloroethane (max)	Soluble matter percent Water (max)	Soluble matter percent Total (max)	Ash content (max) percent	Tensile strength (min) p.s.i. 2/	Splitting resistance (min) lb per 2 inches of width 2/	Width (min) inches	Color	Thickness, inches Nominal	Thickness, inches Min	Thickness, inches Max	Weight, lb per sq yd Min	Weight, lb per sq yd Max
12N5 3/	Needle-punched	45	4.0	3.0	7.0	3.0	525	14	72	Gray	1/2	0.474	0.526	5.80	6.80

1/ The wool fiber content shall be based on the original dry weight of the specimen when tested as specified in 4.4.3.

2/ The requirement is applicable to both lengthwise and crosswise directions separately.

3/ The felt shall also contain a minimum of 45 percent polyester and a maximum of 5 percent polypropylene and 5 percent unspecified fibers.

3.4.1 Width. Types I, III and IV felts shall be trimmed and the minimum width after trimming shall be as specified in tables I, III and IV.

3.4.2 Ammunition felt. When ammunition felt is specified (see 6.2), the requirements cited in 3.4.2.1, 3.4.2.2, and 3.4.2.3 shall apply.

3.4.2.1 pH and organic acidity. When tested as specified in 4.4.3, a water extract of ammunition felt shall have a pH value of 7.0 ± 1.0 and the organic acidity of the extract calculated as acetic acid shall not exceed 0.12 percent.

3.4.2.2 Soluble matter. Ammunition felt shall have a 2.5 percent maximum 1,1,1-trichloroethane extractable content and 1.5 percent maximum water extractable content when tested as specified in 4.4.3.

3.4.2.3 Tensile strength. Ammunition felt of 1/16- and 3/32-inch thickness in classification 12R3X shall have a minimum tensile strength of 125 pounds per square inch (p.s.i.) for both lengthwise and crosswise directions when tested as specified in 4.4.3.

3.4.3 Mildew resistant treatment. When specified (see 6.2), the felt shall be mildew resistant treated in accordance with MIL-F-2312 except that for 9R-1 through 9R-5, 2 inch, the complete penetration of the treatment shall not be required and the contractor shall certify the amount and kind of inhibitor which was applied. The physical and chemical characteristics of the treated felt shall conform to the requirements specified herein.

3.4.4 Moth repellency. Mothproofing shall be accomplished by the application of the compound specified in table V to wool stock, top, yarn, or cloth.

TABLE V. Mothproofing compound

Mothproofing compound	Percent by weight applied to wool fiber	
	Min	Max
Sodium 5-chloro-2- [4-chloro-2- [3-(3,4-dichlorophenyl)-ureido] phenoxy] benzene sulfonate (see 6.6.1)	(0.65)	(1.45)

3.4.4.1 Finish. The moth-repellent treated felt shall be vacuumed to remove the loose fibers and compound (see 4.4.3).

3.4.5 Color. When specified (see 6.2), the color shall match the shade standard referenced by the contracting activity issuing the invitation for bids.

3.4.6 Matching. When specified (see 6.2), the color of the finished felt shall match the standard sample when viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7500 ± 200K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 ± 200K.

3.4.7 Colorfastness. The colorfastness of the finished felt shall be as specified by the contracting activity issuing the invitation for bids (see 6.2).

3.5 Length.

3.5.1 Types I and IV. Types I and IV felt shall be furnished in rolls of the following lengths. Each roll shall contain not more than two pieces, neither of which shall be less than 3 yards in length. When specified (see 6.2), type I, 3/4 to 2 inch felt may be put up in sheets 72 by 36 inches (minimum).

Thickness (inches)	Length (yards)
5/16 and under	26 to 55
Over 5/16 but not exceeding 1/2	13 to 33
Over 1/2 to 1 inclusive	7 to 17
2	3 to 7

3.5.2 Type II. Type II felt shall be furnished in sheets 36 by 36 inches, ± 1/2 inch.

3.5.3 Type III. The type III felt shall be furnished in rolls of 28 to 80 yards in length for 60, 72, and 80 inch widths, and 24 to 24-1/2 yards in length for 36 inch width. Each roll shall contain not more than two pieces; no piece shall be less than 5 yards in length.

3.6 Identification. Each roll and sheet shall be identified by one of the following methods, as applicable.

3.6.1 Tickets. Unless otherwise specified, each roll of types I, III, and IV felt shall have a ticket attached to the edge at the inner end of the felt with not finer than 5-ply cotton string doubled to not less than 8 inches long. The ticket shall be made of not less than 20-point paper stock and the color shall be white or light in intensity to permit easy reading of printed, stamped, or typed markings. Entries on tickets shall be stamped, printed, or typed. Handwritten entries are prohibited. The ticket shall have a reinforced eyelet for attaching the tying cord and shall be legibly printed with water-insoluble ink with the following information:

Nomenclature, thickness
Color
Type classification
Stock number
Supplier
Contract number and date
Specification number and date
Name of contracting office
Supplier's piece number
Gross yards
Net yards
Inspector

3.6.2 Labels. Each sheet of felt shall have a label attached to the upper righthand corner by staple or pin-ticket attachment. The label shall be made of not less than 20-point paper stock, and the color shall be white or light in intensity to permit easy reading of printed markings. The label shall be legibly printed with water-insoluble ink with the information specified in 3.6.1, except gross and net yards are not required.

3.7 Wool content label. Felt manufactured under this specification shall be labeled in accordance with the Rules and Regulations Under the Wool Products Labeling Act.

3.8 Workmanship. The finished felt shall conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to the requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).
b. Quality conformance inspection (see 4.4).

4.3 First article inspection. When first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.4.2 and tested for the characteristics specified in 4.4.3. The presence of any defect or failure of any test shall be cause for rejection of the first article.

4.4 Quality conformance inspection. Unless other specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.4.1.1 Component examination (types II and III only). In addition to the quality assurance provisions of referenced specifications, components and materials shall be examined in accordance with 4.4.1.1.1 through 4.4.1.1.3.

4.4.1.1.1 Wool. Fleece or pulled wool shall be visually examined for grade (see 3.3.1) in scoured form prior to dyeing, picking, or carding by comparison with the applicable U.S. Standard for Methods of Test for Grade of Wool Top. In the event of a dispute resulting from the above comparison, the grade shall be determined by a width (wedge) method. The examination for grade shall be performed on a composite sample of 1 pound of wool for each 10,000 pounds or fraction thereof in the lot. The composite sample shall be selected from not less than 10 percent of the bales or bags in the lot. The lot shall be unacceptable if the sample does not conform to the requirements for grade specified for the applicable type and class or classification numbers.

4.4.1.1.2 Noils. Noils shall be examined prior to dyeing and blending. Method of sampling, sample size, and acceptance criteria shall be as specified in 4.4.1.1.1.

4.4.1.1.3 Reprocessed and reused wool. Reprocessed and reused wool shall be examined for grade when reduced to the fibrous state prior to blending with other fibers. Method of sampling, sample size, and acceptance criteria shall be as specified in 4.4.1.1.1.

4.4.2 End item examination.

4.4.2.1 Examination for local defects. The felt shall be examined for the defects listed in table VI. The defects shall be classified according to the applicable group designation indicated in table VII. The felt shall be examined on one side only. However, for each successive roll or sheet in the sample, that side shall be alternated. All defects shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition, in which case only one defect shall be counted. In roll felt, a defect extending over more than 1 continuous linear yard shall be counted as one defect for each such yard, or fraction thereof, in which it occurs. The sample unit shall be 1 linear yard for rolls and one sheet for sheet felt. The lot size shall be expressed in linear yards for roll felt and in sheets for sheet felt. The inspection level shall be I and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be as specified in table VII. For types I and IV felt which is 1/2 inch or less thick, and for type III felt, the number of rolls from which the sample yardage is to be selected shall be in accordance with table VIII. The sample yardage shall be apportioned equally among the selected rolls. For type I felt more than 1/2 inch thick, the number of rolls from which the sample yardage is to be selected shall be sufficient to yield the required yardage with the entire yardage of each roll examined.

TABLE VI. Classification of defects (see accompanying table VII)

	Group I	Group II		Group III		Group IV		Group V		Group VI			Group VII		
	Major (one class)	Maj	Min	Maj	Min	Maj	Min	Maj	Min	Maj	Min A	Min B	Maj	Min A	Min B
Cut, hole, or tear	X	X	-	X	-	X	-	X	-	X	-	-	X	-	-
Open, breaks, or thin area	X	X	-	X	-	X	-	-	X	-	-	X	-	X	-
Abrasion or rub	X	X	-	X	-	X	-	-	X	-	-	X	X	-	-
Surface nappiness or glossier than adjoining normal areas	X	X	-	X	-	X	-	X	-	X	-	-	X	-	
Wrinkles or creases	X	X	-	X	-	X	-	-	X	-	X	-	-	-	X
Surface pucker or ripple	X	X	-	-	X	-	X	X	-	X	-	-	-	-	X
Waviness or inability to lay flat	X	X	-	X	-	X	-	-	X	-	X	-	-	X	-
High, thick, or lumpy area	X	X	-	X	-	X	-	X	-	X	-	-	-	X	-
Burrs, shives, seed, or other naturally occuring foreign matter	X	-	X	-	X	-	X	X	-	-	-	X 1/	-	-	X
Spots, stains, or streaks not due to fiber distribution or bleeding	X	-	X	-	X	-	X	X	-	X	-	X	-	-	X
Scalloped, cutout, narrow, jagged or untrimmed edge extending 9 inches or more on a side	X	X	-	X	-	X	-	X	-	-	-	X	X	-	-
Soft area noticeably less firm than adjoining normal areas	X	X	-	X	-	X	-	-	X	-	-	X	-	X	-
Extraneous foreign matter	X	-	X	-	X	-	X	X	-	-	X	-	-	-	X
In sheet felt, any side not specified length	X	X	-	X	-	-	-	-	-	-	-	-	X	-	-

1/ Not applicable to type III, IIA2 felt (see table III).

TABLE VII. Acceptable quality levels

Group designation	Type I classification No.	Type II classification No.	Type III classification No.	Roll Felt			Sheet Felt		
				Major defects (one class)	Total Maj & Min defects combined or total Maj & Min A defects combined (as applicable)	Totals (Maj, Min A & Min B defects combined)	Major (one class)	Total Major & Min A	Totals (Maj, Min A & Min B defects combined)
I	9R1 16R1X 16R1	12S1 26S1 16 1 32S1 20S1	6A1 7 1	15.0					
II	16R2 16R3 16R3X	12S2 26S2 16S2 32S2 20S2	3A1 5A1 4A1 8A1	10.0	15.0	-	4.0 10.0 1/	6.5 15.0 1/	-
III	12R3X	12S3 20S4 12S4 26S3 16S3 26S4 16S4 32S3 20S3 32S4		10.0	25.0	-	4.0	10.0	-

TABLE VII. Acceptable quality levels (cont'd)

Group designation	Type I classification No.	Type II classification No.	Type III classification No.	Type IV classification No.	Roll Felt			Sheet Felt		
					Major defects	Total Maj & Min defects combined or total Maj & Min A defects combined (as applicable)	Totals (Maj, Min A & Min B defects combined)	Major	Total Major & Min A	Totals (Maj,, Min A & Min B defects combined)
IV	9R2 9R3	12R2 12R3		12N5	10.0	25.0	-	-	-	-
V			10A1		10.0	25.0	-	-	-	-
VI				9A2 11A1 10A2 11A2	4.0	10.0	40.0	-	-	-
VII	8R5 9R4 9R5				6.5 2.5 2/	15.0 6.5 2/	40.0 15.0 2/	Same AQL's apply if 9R5 felt is furnished in 72 by 36 sheets.		

1/ This AQL applies to type III, 3A1 60 by 40 inch sheet felt.

2/ This AQL applies to type I, 8R5, 36 inch wide felt.

TABLE VIII. Sample yardage selection

Lot size in yards or sheets	Sample size in		Maximum number of defects acceptable in sample	
	Rolls 1/	Sheets 1/	Rolls	Sheets
Up to 1200	3	7	0	0
1,201 up to and including 3,200	5	10	0	0
3,201 up to and including 10,000	7	15	0	0
10,001 up to and including 35,000	10	25	0	1
35,001 up to and including 150,000	15	35	1	2
150,001 and over	25	50	1	3

1/ If the lot contains fewer than the required number of rolls or sheets, each roll or sheet in the lot shall be examined.

4.4.2.2 Examination for overall defects. Each defect shall be counted not more than once in a roll or sheet. The sample unit shall be one roll or sheet. The number of rolls or sheets selected for this examination shall be in accordance with table VIII. The lot shall be unacceptable if the defects found exceed the maximum number permitted in table VIII.

Overall defects

Color - Types I, II and IV, wrong color (i.e., not white, natural (gray), or as specified)
Type III - Off shade, shaded, mottled, nonuniform (applicable only when felt is required to match a specified shade)
Rancid or offensive odor
Ticket or tag not attached
Marking incorrect, incomplete, or illegible
Not labeled in accordance with the Wool Products Labeling Act

4.4.2.3 Examination for length.

4.4.2.3.1 Individual rolls (types I, III and IV). The roll shall be examined for the defects listed below. The sample unit for this examination shall be one roll. The number of rolls selected as the sample (sample size) for this examination and the acceptance number shall be in accordance with table VIII.

Length defects

Any gross length less than the minimum specified or more than 2 yards less than the gross length marked on the ticket
Any gross length more than the maximum specified
Any roll containing more than two pieces
Any piece less than 5 yards (type III)
Any piece less than 3 yards (types I and IV)

4.4.2.3.2 Examination for total yardage (types I, III and IV) and count (type II). The lot shall be unacceptable if the total of the actual gross lengths of the rolls in the sample is less than the total of the gross lengths marked on the roll tags or if the number of sheets in any container is less than that marked on the container. The number of rolls or containers selected as a sample for this examination shall be those taken for the overall examination.

4.4.3 End item testing. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in table X shall be followed. The physical and chemical values specified in section 3 and tables I, II, III and IV apply to the results of determinations made on a sample unit as specified in the applicable test method. The sample unit shall be: Types I, III and IV over 40 inches wide, 1/2 yard full width; types I, II and IV under 40 inches wide,

1 yard full width; type II, one sheet. The sample size (number of sample units) shall be as specified in table IX. Each sample of types I, III and IV felts shall be cut from the roll at a distance from the end of the roll not less than the width of the roll. All test reports shall contain the individual values utilized in expressing the final result. Unless otherwise specified, all testing shall be performed on samples conditioned in accordance with section 4 of FED-STD-191. The lot shall be unacceptable if one or more units fail to meet any requirement specified.

TABLE IX. Sample size for end item testing

Lot size (yards or sheets)	Sample size (sample units)
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

TABLE X. End item tests

Characteristic	Requirement reference	Test method	Number of determinations per sample unit	Results reported as
Weight:				
Types I, II and IV	Tables I, II and IV	4.5.1	3	Average of the three determinations to the nearest 0.01 lb/sq yd
Type III	Table III	4.5.1	3	Average of the three determinations to the nearest 0.01 oz or 0.01 lb/sq yd, as applicable

TABLE X. Enc item tests (cont o.

Characteristic	Requirement reference	Test method	Number of determinations per sample unit	Results reported as
Thickness	Tables I, II, III and IV	5030 1/	3 specimens (5 determinations each)	Average of three specimens to the nearest 0.001 inch
Water thickness swell	Table II	4.5.2	3	Average of the three determinations to the nearest 1 percent
1,1,1- trichloroethane soluble matter	Tables I, II, III, IV and 3.4.2.2	2611 2/	2	Average of the two determinations to the nearest 0.1 percent
Water soluble matter	Tables I, II, IV and 3.4.2.2	2611	2	Average of the two determinations to the nearest 0.1 percent
Total 1,1,1-trichloroethane and water soluble matter	Tables I, II III and IV	2611 2/	2	Average of the two determinations to the nearest 0.1 percent
Wool content	Tables I, II, III, and IV	2101 2/ 3/	2	Average of the two determinations to the nearest 1 percent
Polyester content	Table IV	4/		
Polypropylene content	Table IV	4/		
Ash content	Tables I, II and IV	4.5.3	2	Average of the two determinations to the nearest 0.1 percent
Breaking strength:				
Lengthwise	Table III	5100	5	Average of the five determinations to the nearest 1 lb
Crosswise	Table III	5100	5	

TABLE X. End item tests (cont'd)

Characteristic	Requirement reference	Test method	Number of determinations per sample unit	Results reported as
Splitting resistance 5/:				
Lengthwise	Tables I, II and IV	4.5.4	5	Average of the five determinations to the nearest 1 lb per 2-inch width
Crosswise	Tables I, II and IV	4.5.4	5	
Tensile strength 6/:				
Lengthwise	Tables I, II, IV and 3.4.2.3	5100	5	Average of the five determinations to the nearest 1 lb per sq in
Crosswise	Tables I, II, IV and 3.4.2.3	5100	5	
pH (when applicable)	3.4.2.1	4.5.5	2	Average of the two determinations to the nearest 0.1 pH value
Organic acidity (when applicable)	3.4.2.1	4.5.6	2	Average of the two determinations to the nearest 0.01 percent
Moth repellency	3.4.4	2015.1	2	Average of the two determinations to the nearest 0.1 percent
Trace of loose fibers and compounds 4/	3.4.4.1	Visual	1	Pass of fail

1/ Except that three specimens of not less than 40 square inches each shall be used and five determinations shall be made on each specimen.

2/ Except that 1,1,1-trichloroethane shall be used in lieu of chloroform.

3/ Except that the wool content shall be based on the weight of the original dry specimen, and shall be calculated as follows:

$$\text{Wool, percent} = \frac{(S-(R/0.95)) \times 100}{O}$$

Where O = Weight of original dry specimen
S = Weight of dry extracted specimen
R = Weight of fiber residue

Note: The 0.95 in the above formula is a correction factor for cotton dissolved by sodium hydroxide solution.

4/ The contractor shall submit a certificate of compliance for this characteristic.

5/ Not required on felt less than 3/16-inch thick.

6/ Method 5100, except ten 2 by 6-inch specimens shall be cut with a die from each test sample, five taken lengthwise and five crosswise of the piece. The jaws of the clamps shall be not less than 2 inches in width. The thickness of each specimen shall be measured and the cross-sectional area of each specimen shall be calculated before testing. The tensile strength shall equal the breaking load divided by the cross-sectional area.

4.4.4 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

Examine	Defect
Marking (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Any component missing, damaged (affecting serviceability), or not as specified
Workmanship	Inadequate application of components, such as: incomplete closure of rolls, inadequate sewing or sealing of wrapping, improper taping, loose strapping materials, or loose ties Bulged or distorted container

Examine	Defect
Preservative (naphthalene)	Improper, improperly applied, or missing
Weight	Net weight exceeds requirements

4.4.5 Palletization examination. The fully packaged and palletized end items shall be examined for the defects listed below. The lot size shall be expressed in units of palletized unit loads. The sample unit shall be one palletized unit load, fully packaged. The inspection level shall be S-1 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

Examine	Defect
Finished dimensions	Length, width, or height exceeds specified maximum requirement
Palletization	Pallet pattern not as specified Interlocking of loads not as specified Load not bonded as specified
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application

4.5 Methods of inspection.

4.5.1 Weight.

4.5.1.1 Weight (types I, III, and IV felts). Each of the three specimens shall be conditioned, accurately measured, and then weighed on a balance sensitive to 0.1 percent of the total weight. The average weight and area shall be used in calculating the weight in pounds per square yard or ounces per square yard, as applicable.

4.5.1.2 Weight (type II felt). The weight of type II felt shall be determined by weighing an entire sheet to the nearest 0.01 pound on an accurately calibrated scale. The size of the sheet shall be accurately measured with a steel rule or tape and the area computed to the nearest 0.01 square yard. From the measurements of sheet weight and area, the equivalent weight in pounds per square yard of the sheet shall be computed.

4.5.2 Water thickness swell. Three specimens, each approximately 2 by 2 inches, shall be cut from different portions of the sheet. The thickness of the test specimens shall be accurately measured in accordance with Method 5030 of FED-STD-191. The specimens shall then be placed on a wire screen having 1/4-inch openings and immersed in boiling water for 2 minutes. A wetting agent shall be used for hard felts which will not wet out thoroughly in boiling water in 2 minutes. The specimens shall then be removed and dried to a constant weight at 105° ± 5°C. The percentage of water thickness swell shall be calculated as follows:

$$\text{Thickness swell, percent} = \frac{T_2 - T_1}{T_1} \times 100$$

Where T_1 = Average thickness of original specimen
T_2 = Average thickness of specimen after wetting and drying

4.5.3 Ash content. The ash content shall be determined according to total inorganic material of Method 2611 of FED-STD-191 except that the temperature of the muffle furnace shall be 800° to 1000°C.

4.5.4 Splitting resistance. The splitting resistance shall be determined using the apparatus as specified in Method 5100 of FED-STD-191. Ten 2-inch by 6-inch specimens shall be cut with a die from each sample unit, five taken with the 6-inch dimension parallel to the length and five perpendicular to the length. Split the conditioned specimens within the middle third of the thickness for a distance of approximately 2 inches from one end only. Clamp one of the lips in each jaw of the testing machine. Start the machine and record, as the splitting resistance in pounds, the average load in pounds necessary to pull the two sections of the felt wholly apart. Average the test results on the five specimens cut lengthwise and on the five specimens cut crosswise, respectively, and report separately as the splitting resistance in pounds per 2 inches of width. This test is not required for material less than 3/16 inch thick.

4.5.5 pH value of water extract. The specimen shall be approximately 5 grams cut into small cubical pieces not more than 0.25 inch on a side. Weigh accurately and place in a 250-milliliter beaker. Add 150 mL of distilled water and macerate the pieces with a glass rod (flattened at the end) until all the fibers are wet. Cover the beaker with a watchglass and allow to stand 3 hours at room temperature with occasional stirring. Determine the pH value of the water extract using a previously calibrated meter equipped with a glass electrode. Retain the water extract for the determination of organic acidity.

4.5.6 Organic acidity. Use the water extract obtained in 4.5.5. Titrate the solution potentiometrically to a pH of 8.3 using a glass electrode and 0.1N sodium hydroxide solution. Make a blank determination and calculate the percent organic acidity of the water extract as acetic acid as follows:

$$\text{Percent organic acidity} = \frac{6.005\ (V-v)N}{W}$$

Where: V = milliliters of sodium hydroxide solution used to titrate the water extract
v = milliliters of sodium hydroxide solution used to titrate the blank
N = normality of the sodium hydroxide solution
W = weight of specimen (grams)

5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial, as specified (see 6.2).

5.1.1 Level A preservation. Types I, III, and IV felt shall be wound open width on convolute chipboard tubes, except that the felts 1/2 inch or greater in thickness need not be wound on a tube. The ends of the tube shall be flush with, or extend not more than 1 inch beyond each side of the width of the rolled felt. Type II felt sheets shall be neatly stacked in a bundle. Each roll or bundle shall be completely enclosed in two thicknesses of 60-pound basis weight kraft paper conforming to A-A-203. The paper wrapping shall be secured with 2-inch minimum width gummed paper tape conforming to type III, grade B of PPP-T-45. When felt material has not already been treated for moth repellency, naphthalene flakes or chips shall be evenly distributed over the felt before wrapping. The amount used shall be not less than 1-1/2 pounds to 30 yards of types I, III and IV felt, or 50 square feet of type II felt.

5.1.2 Commercial preservation. Felt shall be preserved in accordance with ASTM D 3951.

5.2 Packing. Packing shall be level A, B, or Commercial, as specified (see 6.2).

5.2.1 Level A packing. Each roll or bundle of felt, preserved as specified in 5.1, shall be completely overwrapped in a waterproofed flexible sheet conforming to type III, grade B or C of MIL-L-10547. The seams and folds of the overwrap sheet shall be secured by one of the methods specified in the appendix of MIL-L-10547. Each overwrapped roll or bundle of felt shall be wrapped and sewn in cotton osnaburg cloth conforming to type I, class 2 of CCC-C-429 or jute (or kenaf) burlap cloth conforming to class 3 of CCC-C-467. The wrapping shall be securely sewn with 16-ply cotton twine conforming to T-T-871 or jute twine conforming to type I of T-T-911, with approximately one stitch to the inch and every third stitch knotted or, alternatively, the seams

of the wrap may be machine sewn. In lieu of the sewn wrapping, the cloth covering bias-sewn tubing conforming to MIL-T-40625 may be used. A minimum of 5 inches of wrapping material or tubing shall be gathered together on each of the four corners and securely sewn into ears for handles. Wherever machine sewing is used, the thread type, stitch type, and number of stitches per inch shall conform to the requirements specified in MIL-T-40625. Alternatively, shipping containers may be used that conform to overseas type of PPP-B-601, or class 2, style 2 or 4 of PPP-B-621. Each shipping container shall be closed and strapped in accordance with the appendix of PPP-B-601, or PPP-B-621, as applicable. The weight of rolls and bundled sheets of felt in a cloth covering or shipping container shall not exceed 200 pounds, except where the prescribed length allowance of an individual roll exceeds this weight.

5.2.2 Level B packing. Each roll or bundle of felt, preserved as specified in 5.1, shall be wrapped in cloth covering as specified in 5.2.1. The waterproof barrier-material overwrap shall not be required. Alternatively, shipping containers may be used that conform to domestic type, style A or B of PPP-B-601, or class 1, style 2 or 4 of PPP-B-621. The weight of rolls and bundled sheets of felt in a cloth covering or shipping container shall not exceed 200 pounds, except where the prescribed length allowance of an individual roll exceeds this weight.

5.2.3 Commercial packing. The felt, preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), felt, packed as specified in 5.2.2 and 5.2.3, shall be palletized on a 4-way entry pallet in accordance with load type I of MIL-STD-147. Pallet type shall be type I (4-way entry), type IV or type V in accordance with MIL-STD-147. Pallets shall be fabricated from wood groups I, II, III, or IV of MIL-STD-731. Each prepared load shall be bonded with primary and secondary straps in accordance with bonding means K and L or film bonding means O or P. Pallet pattern shall be in accordance with the appendix of MIL-STD-147. Interlocking of loads shall be effected by reversing the pattern of each course.

5.4 Marking.

5.4.1 Civil agencies. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with FED-STD-123 or ASTM D 3951, as applicable.

5.4.2 Military requirements. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

6. NOTES

6.1 Intended use. Tables XI, XII, XIII, and XIV show the suggested applications for the various classifications of types I, II, III, and IV felts respectively.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. Type, class (when applicable), classification number, thickness, and weight required (see 1.2 and 3.4).
c. When a first article is required (see 3.1, 4.3, and 6.3).
d. When ammunition felt is required (see 3.4.2).
e. When mildew resistant treatment is required (see 3.4.3).
f. When moth repellency is required (see 3.4.4).
g. Color, colorfastness, and matching conditions if required (see 3.4.5, 3.4.6, and 3.4.7).
h. Length for types I and IV if other than specified (see 3.5.1).
i. Levels of preservation and packing (see 5.1 and 5.2).
j. When palletization is required (see 5.3).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Sample. For access to samples, address the contracting activity issuing the invitation for bids or request for proposal.

6.5 Felts.

6.5.1 Type I felts. Type I felts are classified by a code letter consisting of a letter "R" preceded by a numeral to indicate consistency in terms of density (unit weight in pounds per square yard of one inch nominal thickness) and followed by a second numeral to indicate the difference in class based on specification requirements (see table I), and as follows:

Classification	Class	Trade designation
8R	5	Soft pad
9R	1, 2, 3, 4, 5	Firm pad
12R	1, 2, 3	Extra firm pad
	3X	Lining
16R	1, 2, 3	Backcheck
	1X, 3X	Ball bearing
18R	1	Laundry

NOTE: The letter "X" indicates felt less than 1/8 inch in thickness.

TABLE XI. Suggested service applications for type I felts

Classification number	Suggested service application
18R1	For uses where a hard, high-grade felt possessing long wearing properties is desired.
16R1	For oil retention in installations where the felt is not compressed, for feeding low viscosity or light oil, and where unusual strength and hardness are required. Washers; bushings; wicks; ink rolls and pads; door bumpers; polishing blocks; wheels and pads; grommets; window channels; resilient mountings, antivibration and dampening pads; and parts where wear and resistance to abrasion are required are typical uses.
16R2	For vibration mounting, oil and grease shields, and the same general purposes as 16R1 where a felt of slightly lower quality is satisfactory.

TABLE XI. Suggested service applications for type I felts (cont'd)

Classification number	Suggested service application
16R3	For ammunition components. For aircraft applications, between rocker arm covers of engines, ring cowlings, radio cushion strips, retaining and feeding oil under difficult conditions, washers and bushings.
12R1 12R2 12R3	For dust shields, wipers, grease retainer washers, wicks, vibration mountings, and uses where a resilient felt is required.
9R1 9R2 9R3	For grease and oil retention where the felt is confined and compressed in assembly. Also recommended for dust shields under less severe operating conditions where 12R1, 12R2, and 12R3 are not required.
9R4	For sound deadening, chassis strips, spacers, dust shields, pedal pads, dash liners, and for mechanical purposes where abrasion and wear are not important factors.
8R5	For packing or padding when held in place between other materials. This grade should not be used for mechanical purposes.
16R1X	For ball and roller bearing oil retainer washers and small dust excluding washers. Also for mechanical purposes where an accurate, thin, smooth, high-grade felt is required.
16R3X	For the same general uses as 16R1X but in installations where tolerances and length of life are not as important. Also for thin cut parts such as gaskets and liners.
12R3X	For antisqueak strips and for lining when cemented to fiberboard or metal panels.

6.5.2 Type II felts. Type II felts are classified by a code letter consisting of the letter "S" preceded by a numeral to indicate consistency in terms of density (unit weight in pounds per square yard of one inch nominal thickness) and followed by a second numeral to indicate class based on specification requirements (see 3.3.1.1 and table II) and as follows:

Classification	Class	Trade designation
32S	1 to 4	Extra hard
26S	1 to 4	Hard
20S	1 to 4	Medium
16S	1 to 4	Soft
12S	1 to 4	Extra soft

TABLE XII. Suggested service applications for type II felts

Classification	Qualities	Service application
32S extra hard	32 S 1 Fine 32 S 2 Medium fine 32 S 3 Medium coarse 32 S 4 Coarse	For use as extra hard-density polishing wheels and buffs in dental, jewelry, glass, and lapidary polishing; also hard washers, bumpers, and casters.
26S hard	26 S 1 Fine 26 S 2 Medium fine 26 S 3 Medium coarse 26 S 4 Coarse	For use as hard-density polishing wheels for glass sheet, glassware, ophthalmic lens polishing, metal and metallographic polishing, wood polishing, and furniture rubbing, also for block cutters, print rolls, cash carrier heads, points for marking pens, casters, boot and shoe soles, artificial limbs.

TABLE XII. Suggested service applications for type II felts (cont'd)

Classification	Qualities	Service application
20S medium	20 S 1 Fine 20 S 2 Medium fine 20 S 3 Medium coarse 20 S 4 Coarse	For use as medium hard-density polishing wheels and buffs for lens polishing, mirrors and glass, marble and granite; also for fluid transfer rolls, ink rolls, securing, furniture rubbing, rough metal polishing, metal wiping, drilled wicks, bearing seal washers, stamp pads, cushioning under sandpaper.
16S soft	16 S 1 Fine 16 S 2 Medium fine 16 S 3 Medium coarse 16 S 4 Coarse	For use as medium-density polishing wheels and buffs for precious metal and plastic polishing, rough optical polishing, metal wiping, drum beaters; also drilled wicks, bearing seals, shoe rolls (shank), fluid transfer rolls, oil and fluid wicks, grease and oil retaining washers, ink rollers, vibration and shock mountings, bumpers, plugs, glass channels.
12S extra soft	12 S 1 Fine 12 S 2 Medium fine 12 S 3 Medium coarse 12 S 4 Coarse	For use as soft-density polishing wheels and buffs for polishing plastic, polishing and wiping brass; also for piano wedge, surgical pads, punched wicks, dampeners, absorbent pads, oil and fluid retainers, fluid transfer rolls, bearing seals, washers, wicks, shim and spacer pads, shoe insoles, dust shields, antivibration pad.

6.5.3 Type III felt. Type III felts covered by this specification are classified by a code letter consisting of the letter "A" preceded by a numeral to indicate difference in commercial designation and followed by a second numeral to indicate the class based on specification requirements (see table III) and as follows:

Classification	Class	Trade designation
11A	1, 2	Coat front
10A	1, 2	Lining; lining, shoe tongue
9A	2	Lining
8A	1	Undercollar, face mask
7A	1	Chevron facing, cap
6A	1	Chevron backing, auto flats and face mask
5A	1	Orthopedic truss and athletic padding
4A	1	Surgical
3A	1	Midsole

TABLE XIII. Suggested service applications for type III felts

Trade designation	Suggested service application
Coat front felt	For use in fronts of coats to give required fullness and drape to outer fabrics
Lining felt	For use as a lining material in outerwear garments
Lining, shoe tongue felt	For use as a lining on inside of the shoe tongue, generally white in color. Backing for household objects to prevent scratching or marking furniture
Chevron, face mask, hat body, undercollar felt	For use in garment decoration, background, for embroidered designed hat bodies, undercollar cloth, military insignia
Orthopedic truss athletic padding felt	For use as padding on orthopedic and truss and appliances, athletic equipment padding
Surgical felt	This type of felt can be pulled down in layers to graduated thicknesses needed for medical requirements
Midsole	For use in footwear as lining or inserts

6.5.4 Type IV felt. Type IV felts are classified by a code letter consisting of a letter "N" preceded by a numeral to indicate consistency in terms of density (unit weight in pounds per square yard of one inch nominal thickness) and followed by a second numeral to indicate the difference in class based on specification requirements (see table IV), and as follows:

Classification	Class	Trade designation
12N5	5	Needlepunched

TABLE XIV. Suggested service applications for type IV felts

Classification number	Suggested service application
12N5	For dust shields, wipers, grease retainer washers, wicks, vibration mountings, and uses where a resilient felt is required.

6.6 Moth repellent treatment. The approval of moth repellent finishes is the responsibility of U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760 and is based on extensive tests, including those for toxicity which are not set forth in this specification. Because of the time necessary to conduct full evaluation (approximately 6 months), only those chemical treatments already approved and so listed in the invitation for bids or request for proposals shall be considered acceptable for the related procurement.

6.6.1 Sodium 5-chloro-2- [4-chloro-2- [3-(3,4-dichlorophenyl)-ureido] phenoxy] benzene sulfonate. The formulation containing sodium 5-chloro-2-[4-chloro-2- [3,4-dichlorophenyl)-ureido] phenoxy] benzene sulfonate may be obtained under the trade name MItin FF High Concentrate from Ciba-Geigy Corp., Dyestuffs and Chemical Division, P.O. Box 18300, Greensboro, NC 27409-8300.

6.7 International standardization agreements. Certain provisions of this specification are the subject of international standardization agreement as cited in NATO, STANAG NO. 2128, relative to type III, class 4A1. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.8 Subject term (key word) listing.

Ammunition felt
Lining, felt
Nonwovens

MILITARY INTERESTS:

Custodians

Army - GL
Navy - NU
Air Force - 99

Review Activities

Army - MD
Air Force - 82
DLA - CT

User Activities

Navy - MC, OS
Air Force - 45

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - FSS

PREPARING ACTIVITY:

Army - GL

(Project 8305-0204)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1 DOCUMENT NUMBER	2 DOCUMENT TITLE
C-F-206G	FELT SHEET: CLOTH, FELT, WOOL, PRESSED

3a NAME OF SUBMITTING ORGANIZATION	4 TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
	☐ USER
b ADDRESS *(Street, City, State, ZIP Code)*	☐ MANUFACTURER
	☐ OTHER *(Specify)* _____

5 PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER *(Last, First, MI)* – Optional	b WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8 DATE OF SUBMISSION *(YYMMDD)*

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